Claims

WHAT IS CLAIMED IS:

1. A computer program product encoding a computer program for executing on a computer system a computer process for determining an amount of a resource consumed during a simulation interval in a performance prediction simulation of a system including software and hardware elements, the computer process comprising:

calculating an aggregate resource requirement associated with the resource in a simulation interval;

calculating a system event horizon for the simulation interval based on a resource usage state change in the system; and

adjusting the aggregate resource requirement based on the system event horizon to provide an adjusted aggregate resource requirement for the resource, wherein the adjusted aggregate resource requirement represents the amount of the resource consumed during the simulation interval.

2. The computer program product of claim 1 wherein the computer process further comprises:

advancing a simulation clock to the system event horizon to start a next simulation interval.

3. The computer program product of claim 1 wherein the system includes a resource configuration, and the computer process further comprises:

receiving a resource topology tree defining the resource configuration of the system, wherein the resource is specified by the resource topology tree.

4. The computer program product of claim 3 wherein the resource topology tree specifies at least one active resource.

5. The computer program product of claim 3 wherein the resource topology tree specifies at least one passive resource.

6. The computer program product of claim 1 wherein the operation of calculating an aggregate resource requirement comprises:

receiving one or more resource requirement contributions from one or more hardware models, each hardware model representing a resource associated with a resource contention timeline; and

combining the resource requirement contributions from the one or more hardware models to provide the aggregate resource requirement.

7. The computer program product of claim 6 wherein the combining operation comprises:

adding the resource requirement contributions together.

38

8. The computer program product of claim 6 wherein the combining operation comprises:

performing a bitwise OR operation on the resource requirement contributions.

9. The computer program product of claim 1 wherein the operation of calculating a system event horizon comprises:

determining a minimum event duration of active events to provide a resource event horizon;

determining a workload event horizon based a start time of a newly activated event; and

selecting an earlier one of the resource event horizon or the workload event horizon to provide the system event horizon.

10. The computer program product of claim 1 wherein the operation of calculating a system event horizon comprises:

passing an aggregate resource requirement to a hardware model to determine a duration of an active event;

calculates in the hardware model the duration of the active event based on resource contention defined by the aggregate resource requirement.

11. The computer program product of claim 1 wherein the computer process further comprises:

creating a resource contention timeline entry storing the adjusted aggregate resource requirement, an identifier of the associated resource, and a start time; and

39

5   inserting the resource contention timeline entry into a resource contention timeline corresponding to the associated resource.

12. The computer program product of claim 11 wherein the computer process further comprises:

presenting the resource contention timeline on a video display in a graphical format.

13. The computer program product of claim 11 wherein the computer process further comprises:

presenting the resource contention timeline on a video display in a text format.

14. A performance simulation system for simulating performance of a computing system including a resource configuration, the performance simulation system comprising:

a sequence processor capable of receiving a resource topology tree describing the resource configuration of the computing system;

5 a calculation module calculating an aggregate resource requirement associated with the resource in a simulation interval and calculating a system event horizon for the simulation interval based on a resource usage state change in the computing system; and

an interval module adjusting the aggregate resource requirement based on the computing system event horizon to provide an adjusted aggregate resource requirement for the resource,

10 wherein the adjusted aggregate resource requirement represents the amount of the resource consumed during the simulation interval.

15. A computer readable medium having stored thereon a data structure for recording resource contention of a system under simulation, the data structure being associated with a resource in the system, the data structure comprising:

a first data field containing data representing a start time for a simulation interval in a performance simulation system simulating performance of the system; and

a second data field containing data representing an amount of the resource used during the simulation interval by the system.

16. The computer readable medium of claim 15 wherein the data structure further comprises:

a fourth data field containing the duration of the simulation interval.

17. The computer readable medium of claim 15 wherein the data structure further comprises:

a fourth data field containing the duration that the amount of resource used is valid, relative to the start time, during the simulation.

18. The computer readable medium of claim 15 wherein the first data field, the second data field and the third data field are included in a first resource contention timeline entry and the data structure further comprises:

a second resource contention timeline entry logically coupled in sequence with the first resource timeline entry to define usage of the resource in the system during a plurality of simulation intervals.

19. The computer readable medium of claim 18 wherein a duration of the simulation interval associated with the first resource contention timeline entry is based on the difference between the start time of the second resource contention timeline entry and the start time of the first resource contention timeline entry.

20. A method of determining an amount of a resource consumed during a simulation interval in a performance prediction simulation of a system, the method comprising:

calculating an aggregate resource requirement associated with the resource in a simulation interval;

5   calculating a system event horizon for the simulation interval based on a resource usage state change in the system; and

adjusting the aggregate resource requirement based on the system event horizon to provide an adjusted aggregate resource requirement for the resource, wherein the adjusted aggregate resource requirement represents the amount of the resource consumed during the

10   simulation interval.

21. The method of claim 20 further comprising:

advancing a simulation clock to the system event horizon to start a next simulation interval.

22. The method of claim 20 wherein the system includes a resource configuration, and the method further comprises:

receiving a resource topology tree defining the resource configuration of the system, wherein the resource is specified by the resource topology tree.

23. The method of claim 22 wherein the resource topology tree specifies at least one active resource.

24. The method of claim 22 wherein the resource topology tree specifies at least one passive resource.

25. The method of claim 20 wherein the operation of calculating an aggregate resource requirement comprises:

receiving one or more resource requirement contributions from one or more hardware models, each hardware model representing a resource associated with a resource contention timeline; and

combining the resource requirement contributions from the one or more hardware models to provide the aggregate resource requirement.

26. The method of claim 25 wherein the combining operation comprises:

adding the resource requirement contributions together.

27. The method of claim 25 wherein the combining operation comprises:

performing a bitwise OR operation on the resource requirement contributions.

28. The method of claim 20 wherein the operation of calculating a system event horizon comprises:

determining a minimum event duration of active events to provide a resource event horizon;

determining a workload event horizon based a start time of a newly activated event; and

44

selecting an earlier one of the resource event horizon or the workload event horizon to provide the system event horizon.

29. The method of claim 20 wherein the operation of calculating a system event horizon comprises:

passing an aggregate resource requirement to a hardware model to determine a duration of an active event;

calculates in the hardware model the duration of the active event based on resource contention defined by the aggregate resource requirement.

30. The method of claim 20 further comprising:

creating a resource contention timeline entry storing the adjusted aggregate resource requirement, an identifier of the associated resource, and a start time; and

inserting the resource contention timeline entry into a resource contention timeline corresponding to the associated resource.

31. The method of claim 30 further comprising:

presenting the resource contention timeline on a video display in a graphical format.

32. The method of claim 30 further comprising:

presenting the resource contention timeline on a video display in a text format.

33. An evaluation engine for simulating performance of a system including a resource, the evaluation engine comprising:

a calculation module calculating an aggregate resource requirement associated with the resource in a simulation interval and calculating a system event horizon for the simulation interval based on a resource usage state change in the system;

an interval module adjusting the aggregate resource requirement based on the system event horizon to provide an adjusted aggregate resource requirement for the resource, wherein the adjusted aggregate resource requirement represents the amount of the resource consumed during the simulation interval.

34. A method of determining an amount of a resource consumed during a performance prediction simulation of a system, the method comprising:

defining a resource configuration of the system to include at least one resource;

associating the at least one resource with a resource contention timeline;

5   calculating an amount of the resource used during one or more simulation intervals of the performance prediction simulation; and

inserting a resource contention timeline entry for each of the one or more simulation intervals into the resource contention timeline, each resource contention timeline entry specifying an amount of the resource used during the simulation interval associated with the resource

10   contention timeline entry.

35. The method of claim 34 wherein a hierarchical resource topology tree specifies the resource configuration

36. A computer program product encoding a computer program for executing on a computer system a computer process for determining an amount of a resource consumed during a performance prediction simulation of a system, the computer process comprising:

defining a resource configuration of the system to include at least one resource;

5   associating the at least one resource with a resource contention timeline;

calculating an amount of the resource used during one or more simulation intervals of the performance prediction simulation; and

inserting a resource contention timeline entry for each of the one or more simulation intervals into the resource contention timeline, each resource contention timeline entry specifying

10   an amount of the resource used during the simulation interval associated with the resource contention timeline entry.

37. The computer program product of claim 36 wherein a hierarchical resource topology tree specifies the resource configuration.

38. A computer program product encoding a computer program for executing on a computer system a computer process for associating a resource with a resource contention timeline during a performance prediction simulation of a system, the computer process comprising:

5   providing a resource configuration based on a hierarchical resource topology tree;

identifying a resource in the system, as specified by the resource configuration;

associating a resource contention timeline with the resource, wherein the resource

contention timeline describes an amount of the resource consumed during the performance

prediction simulation of the system.

39. The computer program product of claim 38 wherein the resource represents an active

resource in the system and is associated with a hardware model capable of contributing to a

specified resource type, and the associating operation comprises:

traversing up the hierarchical resource topology tree from the active resource to identify

5   another resource having a declared resource contention timeline associated with the specified

resource type; and

associating the active resource with the declared resource contention timeline.

40. The computer program product of claim 39 wherein the other resource identified in

the traversing operation is at a higher level of hierarchy in the hierarchical resource topology

tree.

41. The computer program product of claim 39 wherein the other resource is the first

higher-level resource encountered during the traversing operation from the active resource that is

associated with a resource contention timeline of the specified resource type.

42. A method associating a resource with a resource contention timeline during a performance prediction simulation of a system, the method comprising:

providing a resource configuration based on a hierarchical resource topology tree;

identifying a resource in the system, as specified by the resource configuration;

5   associating a resource contention timeline with the resource, wherein the resource contention timeline describes an amount of the resource consumed during the performance prediction simulation of the system.

43. The method of claim 42 wherein the resource represents an active resource in the system and is associated with a hardware model capable of contributing to a specified resource type, and the associating operation comprises:

traversing up the hierarchical resource topology tree from the active resource to identify another resource having a declared resource contention timeline associated with the specified resource type; and

associating the active resource with the declared resource contention timeline.

44. The method of claim 43 wherein the other resource identified in the traversing operation is at a higher level of hierarchy in the hierarchical resource topology tree.

45. The method of claim 43 wherein the other resource is the first higher-level resource encountered during the traversing operation from the active resource that is associated with a resource contention timeline of the specified resource type.